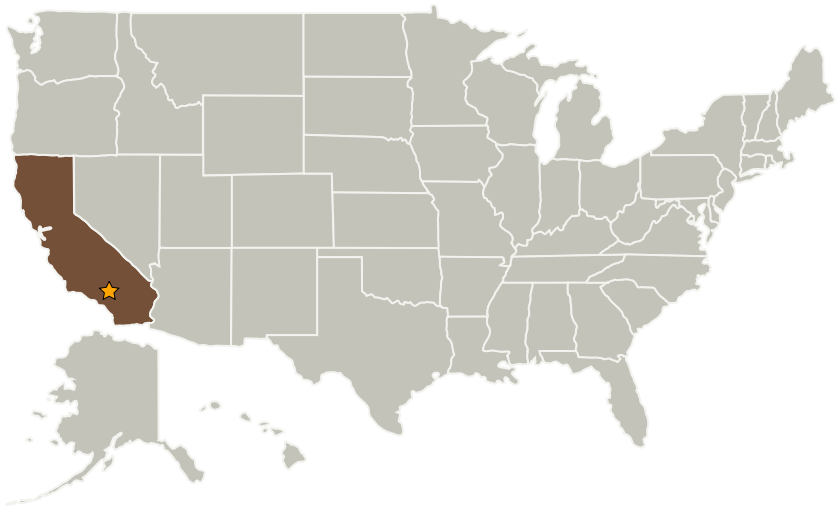
Dynamic Strain and Crack Monitoring Sensor, Phase I

Completed Technology Project (2006 - 2006)

Project Introduction

The development of condition-based monitoring sensor network systems has the potential to provide an enhanced aircraft safety by real time assessment of the aircraft's structural integrity. Los Gatos Research proposes to develop a structural health monitoring sensor system, capable of simultaneously monitoring dynamic strain and structural damages in aircraft components in real time. Our novel sensor technology offers a number of advantages including compactness (0.2mm x 5mm x 5mm), lightweight (few grams), low cost, and fast response (milliseconds). We achieve this by fabricating Bragg gratings on stress-sensitive polymer planar waveguides on a flexible substrate, which is capable of measuring stress, strain, and temperature, and monitoring damages in advanced material structures. In Phase I, using a DFB laser with a feedback control we will demonstrate the sensor's capability to measure both static and dynamic strain with large dynamic range, high accuracy and high sensitivity. In addition, combing the low-cost laser-based demodulation technique and an acousto-ultrasonic method we will demonstrate the polymer gratings' capability to monitor ultrasonic stress waves indicating the presence and severity of damages in a metal structure, when the structure is probed by an ultrasonic wave generation actuator device.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Armstrong Flight Research Center (AFRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Armstrong Flight Research Center(AFRC)	Lead Organization	NASA Center	Edwards, California
Los Gatos Research	Supporting Organization	Industry	Mountain View, California

Primary U.S. Work Locations
California

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.3 Mechanical Systems
    - TX12.3.4 Reliability, Life Assessment, and Health Monitoring